



### THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Solve the following:

(i)	Solve the given differential equation $x \frac{dy}{dx} = y + \sqrt{x^2 - y^2}$ ; $y(x_0) = 0$ where $x_0 > 0$ .	(5)
(ii)	Solve the initial value problem $(\cos x \sin x - xy^2)dx + y(1 - x^2)dy = 0, \quad y(0) = 2$	(5)
(iii)	Define regular singular points also find the regular singular points of the following differential equation $xy'' - 2xy' + 5y = 0$	(5)
(iv)	Find power series solution about ordinary point $x=0$ $(x - 1)y'' + y' = 0$	(5)
(v)	Verify that the piecewise function below is a solution of the given differential equation $xy' - 2y = 0; \quad y = \begin{cases} -x^2, & x < 0 \\ x^2, & x \geq 0 \end{cases}$	(5)
(vi)	Determine whether the given equation is exact. If or otherwise solve $(\sin y - y \sin x)dx + (\cos x + x \cos y - y)dy = 0$	(5)

Solve the following:

Q.2	Solve the differential equation subject to initial condition $(x + y)^2 dx + (2xy + x^2 - 1)dy = 0, \quad y(1) = 1$	(6)
Q.3	Check whether the given functions are linearly dependent or not $f_1(x) = \cos 2x, \quad f_2(x) = 1, \quad f_3(x) = \cos^2 x$	(6)
Q.4	Solve the differential equation subject to initial condition $y''' + 2y'' - 5y' - 6y = 0, \quad y(0) = y'(0) = 0, y''(0) = 1$	(6)
Q.5	Find solution of the Legendre differential equation $(1 - x^2)y'' - 2xy' + 30y = 0$	(6)
Q.6	Solve the following differential equation $y'' - 2y' + 2y = e^x \tan x$	(6)